

## OJT Training Module Cover Sheet

**Title: How to find, access, and use the Web Soil Survey website**

**Type:**     X Skill     ☐ Knowledge

Performance Objective: Trainee will be able to...

- Find and access the Web Soil Survey website
- Use the website to derive soil survey information for a selected Area of Interest (AOI)

Trainer Preparation:

Check access before beginning the module

Special Requirements:

None

Prerequisite Modules:

None

Procedure:

- Hands-on training with application
- Produce a product as directed to measure learning

Notes/Purpose:

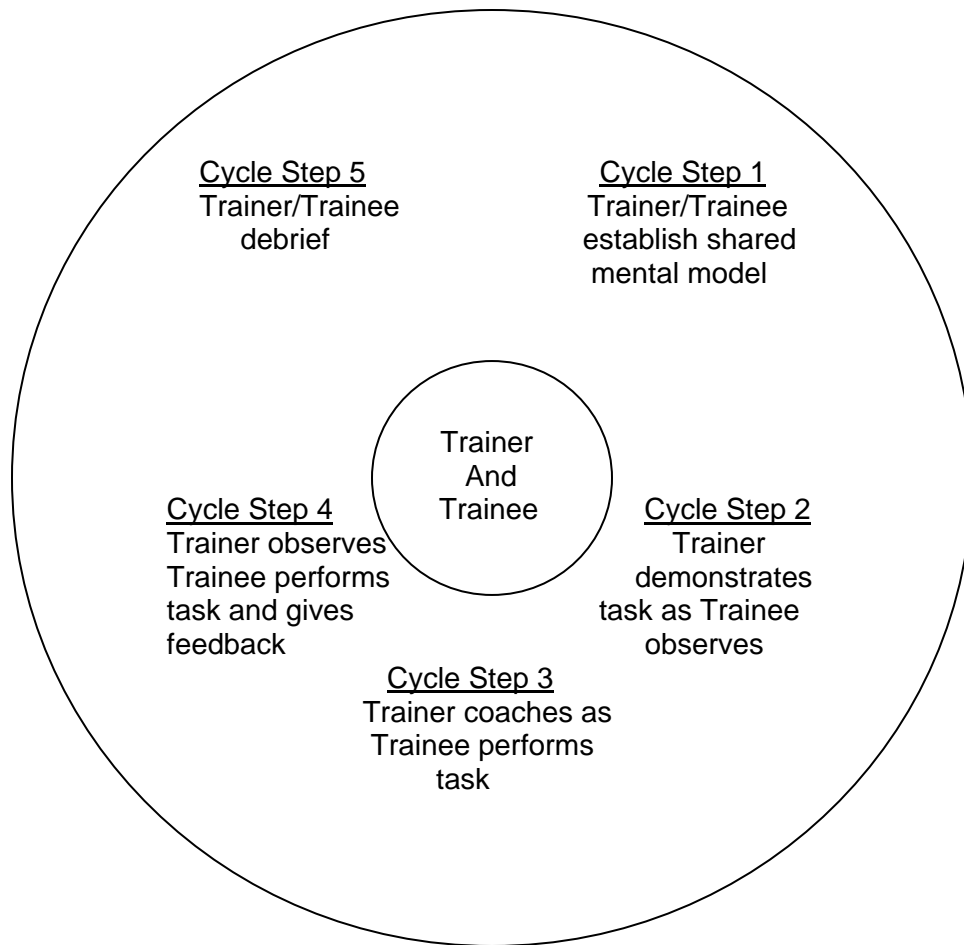
- Pull info for own needs
- Pull information for customers learner may need to serve in office setting

Authors:

- Marc Crouch, NSSC

Approved by:

## The Five Step OJT Cycle for Procedural Training

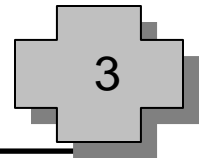


## OJT Module Lesson

Title:	
WHAT	WHY, WHEN, WHERE, HOW, SAFETY, QUALITY
Find and access the WSS website on trainee's computer	Save as favorite and place on trainee desktop
Review the home page <ul style="list-style-type: none"> <li>▪ Three Basic Steps</li> <li>▪ I want to ...</li> <li>▪ Announcements/Events</li> <li>▪ I want help with...</li> <li>▪ Browse by Subject</li> </ul>	Trainer opens all links and files and shows what is at each. No need to read through all material at this point. Just see what is there. Trainee observes.
Find, open, and read through the "How to Use Web Soil Survey" under "I want help with..."	Provide trainee a few minutes to scan through the material. No need to read thoroughly as observing the next step will be a better learning method.
Start WSS	Trainer - "Push" the button
Follow "How to Use Web Soil Survey" to guide you through the website	Trainer performs, trainee observes. Check out all functions, options, etc. of the website
Follow "How to Use Web Soil Survey" to guide you through the website	Switch seats. Trainee performs while trainer provides guidance as needed.
Test learning	Move on to the measurement of learning next page.

## OJT Measurement of Learning

<p>Customer wants soil survey information for two plots of land. They wish to purchase one of the two and want to know what the soils will tell them. They want to use it for pasture and forage, a truck garden, and building a house, barn, and greenhouse. They also want information concerning topsoil sources for use in the greenhouse. Provide them with the information they need.</p>	<p>Trainer observe while trainee performs.</p> <p>Select 2 AOIs anywhere in your survey area. Keep them small, about 200 acres each. It is the process of pulling the information together that is most important. Doing this for 2 areas provides repetition for the learner.</p> <p>Trainer could add or substitute own scenario for measuring learning.</p>
<p>Feedback</p>	<p>Trainer provides feedback and debriefs trainee. Repeat anything as needed until trainee is able to perform without supervision.</p> <p>Complete Performance Report with trainee.</p>



## Trainee OJT Performance Report Form

Trainee's Name: \_\_\_\_\_ Job Title: \_\_\_\_\_

Trainer's Name: \_\_\_\_\_ Date: \_\_\_\_\_

Task (module title)	Date(s) of Training	Rating		Trainer's Comments
		Acceptable	Unacceptable	

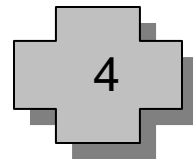
Additional Trainer's comments:

Trainee's Comments:

Action to be taken if unacceptable:

### Signatures

Trainee	Date
Trainer	Date
Supervisor, if different	Date



## OJT Training Module Cover Sheet

**Title: How to use Soil Taxonomy and the Keys to Soil Taxonomy  
- Overview**

**Type:**     ☐ Skill     ☒ Knowledge

Performance Objective: Trainee will be able to...

- Understand what information is in Soil Taxonomy versus Keys to Soil Taxonomy
- Understand what information is in both Soil Taxonomy and Keys to Soil Taxonomy
- Understand when they want to refer to Soil Taxonomy versus Keys to Soil Taxonomy

Trainer Preparation:

- Review this module

Special Requirements:

None

Prerequisite Modules:

None

Procedure:

- Discussion with trainee
- Have Soil Taxonomy and Keys to Soil Taxonomy laid out side by side

Notes/Purpose:

Authors:

- Marc Crouch, NSSC

Approved by:

## OJT Module Lesson

Title: **How to use Soil Taxonomy and the Keys to Soil Taxonomy**

WHAT	WHY, WHEN, WHERE, HOW, SAFETY, QUALITY
Cycle step 1	Review module objectives and procedures
Review Table of Contents of each, Soil Taxonomy and Keys to Soil Taxonomy	<ol style="list-style-type: none"> <li>1. Note chapters in Soil Taxonomy (<b>ST</b>) that are not in Keys to Soil Taxonomy (<b>Keys</b>), and</li> <li>2. Review the contents of each <ul style="list-style-type: none"> <li>▪ <i>Soil Taxonomy and Soil Classification</i></li> <li>▪ <i>Application of Soil Taxonomy to Soil Surveys</i></li> <li>▪ <i>The Categories of Soil Taxonomy</i></li> <li>▪ <i>Nomenclature</i></li> <li>▪ <i>Soils of the United States</i></li> <li>▪ <i>World Distribution of Orders and Suborders</i></li> </ul> </li> </ol>
	<ol style="list-style-type: none"> <li>1. Note the chapter in Keys to Soil Taxonomy that is not in Soil Taxonomy, and</li> <li>2. Review the contents <ul style="list-style-type: none"> <li>▪ <i>Designations for Horizons and Layers</i></li> </ul> </li> </ol>
Compare materials of coincident chapters of <b>ST</b> and <b>Keys</b> and discuss the differences in material provided within each	Chapter: <i>The Soils That We Classify</i> <ul style="list-style-type: none"> <li>▪ <b>Keys</b> has briefer material</li> <li>▪ <b>ST</b> includes paragraphs regarding the Russian concept and its influence on <b>ST</b></li> <li>▪ <b>ST</b> includes a section on “<i>The Pedon, a Unit of Sampling</i>”</li> </ul>
	Chapter: <i>Differentiae for Mineral Soils and Organic Soils</i> <ul style="list-style-type: none"> <li>▪ Note that <b>Keys</b> (10<sup>th</sup> Edition) and <b>ST</b> (2<sup>nd</sup> Edition) are identical except for amendments since 1999 that will be included in <b>Keys</b></li> </ul>
	Chapter: <i>Horizons and Characteristics Diagnostic for the Higher Categories</i> <ul style="list-style-type: none"> <li>▪ <b>Keys</b> has briefer material</li> <li>▪ The <b>Keys</b> provides Required Characteristics same as <b>ST</b></li> <li>▪ <b>ST</b> provides a more in-depth explanation of each horizon or characteristic and their properties</li> </ul>
	Chapter: <i>Identification of the Taxonomic Class of a Soil</i> <ul style="list-style-type: none"> <li>▪ Nearly identical explanatory material</li> <li>▪ Key to Soil Orders sections are identical except for amendments since 1999 that may be included in <b>Keys</b></li> </ul>

<p><u>Continued:</u> Compare materials of coincident chapters of <b>ST</b> and <b>Keys</b> and discuss the differences in material provided within each</p>	<p>Chapters: <u>For each soil Order (12)</u></p> <ul style="list-style-type: none"> <li>▪ <b>Keys</b> provides Key to Suborders, Key to Great Groups for each Suborder, and Key to Subgroups for each Great Group</li> <li>▪ <b>ST</b> provides, with 1999 Keying information:             <ul style="list-style-type: none"> <li>○ Definitions of each order and limits between the Order and soils of other Orders</li> <li>○ A representative pedon and data</li> <li>○ Each Suborder is discussed and defined</li> <li>○ A definition of each Typic Subgroup</li> <li>○ Descriptions of all Subgroups</li> </ul> </li> </ul> <p>Chapter: <i>Family and Series Differentiae and Names</i></p> <ul style="list-style-type: none"> <li>▪ Identical information and Keying opportunities for classes in both <b>ST</b> and <b>Keys</b> except for amendments since 1999 that will be included in <b>Keys</b></li> </ul>
<p>What if there are differences in the information provided?</p> <p>The current <u>printed</u> and online <b>Keys</b> includes all amendments to Soil Taxonomy (Second Edition, 1999) through 2006 and hence is the more up-to-date and current information for classification than the <u>printed</u> or <u>online</u> <b>ST</b>.</p>	<ul style="list-style-type: none"> <li>▪ Take the employee online to see what is available under Technical References-Soil Classification on the soils.usda.gov website   <a href="http://soils.usda.gov/technical/classification/">http://soils.usda.gov/technical/classification/</a> <ul style="list-style-type: none"> <li>○ Soil Taxonomy                     <ul style="list-style-type: none"> <li>▪ Text</li> <li>▪ Maps</li> <li>▪ Errata sheet (only contains edits made shortly after release, does not include any amendments)</li> <li>▪ Proposals to Amend</li> </ul> </li> <li>○ Keys to Soil Taxonomy                     <ul style="list-style-type: none"> <li>▪ Keys, 10<sup>th</sup> Edition</li> <li>▪ Summary of changes</li> <li>▪ Previous versions</li> </ul> </li> </ul> </li> </ul>
<p>What is required to study the nature of a soil?</p> <p>A <b>Pedon</b> extracted from the surface to the base of the soil by some manner.</p>	<ul style="list-style-type: none"> <li>▪ You and the trainee read the section “<i>The Pedon, a Unit of Sampling</i>” in chapter 1, (page 10) of Soil Taxonomy.</li> <li>▪ Discuss the “pedon”</li> </ul>



<p>What is required to differentiate soils at the higher categories of a taxonomy (Order, Suborder, Great Group)?</p> <p><i>Horizons and Characteristics Diagnostic for the Higher Categories</i> as defined in chapter 4 of <b>ST</b> or chapter 3 in <b>Keys</b></p>	<ul style="list-style-type: none"> <li>▪ Complete a brief overview of this chapter in <b>ST</b> (chapter 4) or <b>Keys</b> (chapter 3)</li> <li>▪ Place emphasis on diagnostic horizons and characteristics found in your soil survey area</li> </ul>
<p>Subgroups address features that are important markers of sets of processes as in the higher categories</p>	<p>Subgroups are defined on pages 122-123 of Soil Taxonomy. Take a look and review the three major kinds of Subgroups:</p> <ul style="list-style-type: none"> <li>○ Typic</li> <li>○ Intergrades</li> <li>○ Extragrades</li> </ul> <ul style="list-style-type: none"> <li>▪ Use the example in ST of aquic conditions to relate to these two concepts of the subgroup</li> <li>▪ Use other examples of multiple subgroups for a great group in your soil survey area</li> </ul>
<p>In other soils, subgroups show traits of where dominant processes have been modified</p>	
<p>What is the intent of Families?</p> <p>The intent of Families is to group soils within a subgroup having similar physical and chemical properties that affect their responses to management and manipulation for use.</p>	<ul style="list-style-type: none"> <li>▪ Look at page 123 in <b>ST</b> and page 295 in <b>Keys</b> for a list of family names. 7 are numbered in <b>ST</b> and 9 in <b>Keys</b> but #7-9 in <b>Keys</b> are the same as #7 in <b>ST</b>.</li> <li>▪ Look at chapter 17 in <b>Keys</b> or chapter 21 in <b>ST</b> and discuss the families recognized in your soil survey area</li> </ul>
<p>What is the intent of the Series?</p>	<ul style="list-style-type: none"> <li>▪ Review the Series as defined on page 123 of <b>ST</b></li> <li>▪ Select a subgroup from your soil survey area and take a look at the series within it recognized in your soil survey area</li> <li>▪ Discuss briefly how and why they are the same but different at the same time – same order, suborder, great group, subgroup, family but in different series</li> <li>▪ Discuss briefly how series in the same family are differentiated and why</li> </ul>

From Order to Series...	<p>Provide an overview as a review of how you get from the higher categories to a series</p> <ul style="list-style-type: none"><li>▪ A pedon extracted from the soil</li><li>▪ Diagnostic horizons and characteristics used to drill down through the higher categories<ul style="list-style-type: none"><li>○ Decisions based upon observed, inferred, or measured data</li></ul></li><li>▪ Subgroups relate to the diagnostic horizons and characteristics or subdivisions of the same<ul style="list-style-type: none"><li>○ Decisions based upon observed, inferred, or measured data</li></ul></li><li>▪ All subgroups are divided and 1 or more of 9 families group like soils within the subgroup.<ul style="list-style-type: none"><li>○ Decisions based upon observed, inferred, or measured data</li></ul></li><li>▪ Families are further divided into series<ul style="list-style-type: none"><li>○ Decisions based upon observed, inferred, or measured data</li></ul></li></ul>
-------------------------	--

## Measurement of Learning Quiz



4

1. If I am really hung up on what a particular diagnostic horizon really is, I could go to \_\_\_\_\_ to find all the information I need.
  - a. ST
  - b. Keys
2. Amendments are captured in \_\_\_\_\_.
  - a. ST
  - b. Keys
3. Descriptions of subgroups are found in \_\_\_\_\_.
  - a. ST
  - b. Keys
4. If I am keying a soil out, I could use printed hardcopy of either one (ST or Keys) and feel safe that I will reach the correct conclusion.
  - a. True
  - b. False
5. If I am keying a soil out, I could use ecopy of either one (ST or Keys) and feel safe that I will reach the correct conclusion.
  - a. True
  - b. False
6. I could use the errata sheet found on the website and make changes to my hardcopy of Soil Taxonomy and I would be up-to-date with amendments.
  - a. True
  - b. False
7. If I need definitions for horizon and layer designators, I should refer to \_\_\_\_\_.
  - a. ST
  - b. Keys
8. No amendments have been made to the Family criteria since 1999.
  - a. True
  - b. False

## OJT Training Module Cover Sheet

**Title: Know what environmental issues exist in your soil survey area and how to deal with related emergencies**

**Type:**     ☐ Skill     ☒ Knowledge

Performance Objective: Trainee will be able to...

- Identify environmental issues of concern in the soil survey
- Prevent confronting the issue or issues
- Act appropriately if confronted with one or more of the issues

Trainer Preparation:

- Review attached examples of concerns
- Secure existing or prepare list of environmental concerns for your soil survey area - Terrain (mud, sand, rocks, slope, etc.), Climate (cold, hot, wet, dry, storms, floods, etc.), Wildlife (snakes, bears, mountain lions, etc.), Insects & Arachnids (spiders, ticks, bees, fire ants, etc.), Other
- Include prevention, what to do, listing of contact information, where to go for assistance for each concern

Special Requirements:

None

Prerequisite Modules:

None

Procedure:

- Face to face discussion with employee

Notes/Purpose:

Authors:

- Marc Crouch, NSSC

Approved by:

- Marc Crouch, NSSC

## OJT Module Lesson

Title: <b>Know what environmental issues exist in your soil survey area and how to deal with related emergency issues</b>	
WHAT	WHY, WHEN, WHERE, HOW, SAFETY, QUALITY
Cycle step #1	Discuss objectives of the module
What are the issues of concern in your soil survey area	Review lists prepared showing local issues related to: <ul style="list-style-type: none"> <li>▪ Terrain (mud, sand, rocks, slope, vegetation, etc.)</li> <li>▪ Climate (cold, hot, wet, dry, storms, floods, etc.)</li> <li>▪ Wildlife (snakes, bears, mountain lions, etc.)</li> <li>▪ Insects &amp; Arachnids (spiders, ticks, bees, fire ants, etc.)</li> <li>▪ Other</li> </ul>
Address each issue on your list(s) separately	Why is each a concern
	Where in the area is it a concern
	How to avoid the issue (prevention)
	What to do if confronted with the issue
	Where to go for help if confronted with the issue
	How and who to contact for help if confronted with the issue

## OJT Measurement of Learning

Address each issue of concern	For next several days, SSO Leader presents a scenario addressing an issue of concern and asks employee to respond as to: <ul style="list-style-type: none"> <li>▪ How to prevent</li> <li>▪ What to do</li> <li>▪ Where to go for help</li> <li>▪ Contacts for assistance</li> </ul>
Repetition	Repeat until satisfied that employee knows what to do in all scenarios presented for the soil survey area

## Example Environmental Concerns

### **HEAT STROKE**

#### **What is heat stroke?**

Heat stroke is the most severe form of heat illness and is a life-threatening emergency. It is the result of long, extreme exposure to the sun, in which a person does not sweat enough to lower body temperature.

#### **How can heat stroke be prevented?**

There are precautions that can help protect you against the adverse effects of heat stroke. These include:

- Drink plenty of fluids during outdoor activities, especially on hot days. Water and sports drinks are the drinks of choice; avoid tea, coffee, soda and alcohol as these can lead to dehydration.
- Wear lightweight, tightly woven, loose-fitting clothing in light colors.
- Schedule vigorous activity and sports for cooler times of the day.
- Protect yourself from the sun by wearing a hat, sunglasses and using an umbrella.
- Increase time spent outdoors gradually to get your body used to the heat.
- During outdoor activities, take frequent drink breaks and mist yourself with a spray bottle to avoid becoming overheated.



### ***Black Widow Spiders***

#### **Habitat**

On the underside of ledges, rocks, plants and debris, wherever a web can be strung. Cold weather and drought may drive these spiders into buildings

The venom of the female black widow spider is 15 times as toxic as the venom of the Prairie Rattlesnake. Only a minute amount of the toxin is injected in a single bite by the spider however, so they are rarely fatal. By comparison, the relatively large amount of injected rattlesnake venom results in about 15 to 25 percent mortality among those bitten.

The bite itself is often not painful and may go unnoticed. But the poison injected by the Black Widow bite can cause abdominal pain similar to appendicitis as well as pain to muscles or the soles of the feet. Other symptoms include alternating salivation and dry-mouth, paralysis of the diaphragm, profuse sweating and swollen eyelids.

Persons with heart conditions or other health problems may require a hospital stay. (Heart and lung failure may result in death.) A physician can evaluate the severity of the bite, and give specific antivenin or calcium gluconate to relieve pain if necessary. Healthy people recover rapidly in two to five days.

First aid measures: Apply an ice pack over the bite location and keep the affected limb elevated to about heart level. Try to collect the spider specimen in a small jar or plastic bag for examination by a spider expert, even if you have crushed it. Treatment in a medical facility may be necessary. **Call the Poison Center for additional information.** Poison Centers across the country now have a new national emergency phone number - 1-800-222-



Male Tarantula with a cricket.

## ***Tarantulas***

The Desert Tarantula (*Aphonopelma chalcodes*) grows 2 to 3 inches long and is colored gray to dark brown. It is common to the Sonoran, Chihuahuan and Mojave deserts of Arizona, New Mexico and Southern California. Although the tarantula is frightening in appearance, the chances of being bitten by it are rare and, because it has a rightful place in the outdoors, it should not be wantonly killed or persecuted.

### **Cautions**

If a bite should occur, the venom when injected into humans usually causes only slight swelling, with some numbness and itching which disappears in a short time. The bite has been compared in intensity with a bee or wasp sting. Caution should be used when handling or near a tarantula, as with any wild creature.

**First Aid:** Clean the bite site with soap and water and protect against infection. Skin exposures to the urticating hairs are managed by removing the hairs with tape. Any sign of allergy or breathing problems should be cause for concern - seek medical attention.

## ***Rattle Snakes***



### **Description**

Rattlesnakes come in 16 distinct varieties. There are numerous subspecies and color variations, but they are all positively identified by the jointed rattles on the tail.

### **Watch your step:**

Rattlesnakes are superbly cryptic animals. Their colors and patterns allow them to blend with their surroundings so that they often seem to be invisible. When in the desert it is always best to look where you place your feet. A flashlight should always be carried at night, especially on warm nights when rattlesnakes are very active. Around your home, walkways should be kept clear of brush, as rattlesnakes on barren earth or pavement are more visible. Walkways should be brightly lit.

### ***Rattlesnake Bites***

#### **Dos:**

- Remain calm and reassure the victim.
- Remove all jewelry, watches, etc. from the affected area.
- Immobilize extremity and keep at level below the heart.
- Decrease total body activity as is feasible.
- Move victim to medical facility without delay.

#### **Don'ts:**

- Do not apply ice to the bite area.
- Do not make an incision of any kind.
- Do not use a constriction band or tourniquet.
- Do not administer alcohol or drugs





## Scorpions

### ***Bizarre body***

Scorpions strike fear in many people and have been both hated and admired since ancient times. This is probably due to their fearsome look, with pincers at one end and a stinger at the other. Scorpions are not **insects** but are arachnids, like **spiders**, and have eight legs and two main body regions, the prosoma and the mesosoma

The venom of the scorpion can cause severe pain and swelling at the site of the sting, numbness, frothing at the mouth, respiratory difficulties, muscle twitching, and convulsions. The sting is more dangerous to infants, small children and the elderly. Death is rare, especially in more recent times.

## **FLASH FLOODS**

### ***During a Flood***

Flash floods can occur in Arizona with no rain in sight. A storm that's miles away can produce rushing water that can take you by surprise.

1. Listen to the radio or television for information.
2. Know flash flooding can occur. If there is any possibility of a flash flood, move to higher ground right away. Do not wait for instructions to move.

***Be aware of streams, dry riverbeds, drainage channels, canyons and other areas known to flood suddenly. Flash floods can occur in these areas with or without typical warnings like rain clouds or heavy rain.***

### ***After a Flood***

After a flood happens is when a lot of injuries take place. These tips will help to keep you safe.

- Stay away from power lines and electrical wires. The number two flood killer after drowning is electrocution. Electrical current can travel through water. Report downed power lines to the power company or the County Sheriff's office.

- Look out for animals, especially snakes. Small animals that have been flooded out of their homes may seek shelter in yours, or in debris left on your property. Use a pole or stick to poke and turn things over and scare away small animals.
- Look before you step. After a flood, the ground and floors are covered with debris including broken bottles and nails. Floors and stairs that have been covered with mud can be very slippery.
- Be alert for gas leaks. Use a flashlight to inspect for damage. Don't smoke or use candles, lanterns, or open flames unless you know the gas has been turned off and the area has been ventilated.
- Wait before entering a structure damaged by flooding. Structures that have been damaged by flooding may not be safe to enter. Wait for the building to be inspected before entering. If the structure is deemed unsafe, arrangements will be made for you to be able to retrieve valuables left behind.

### ***If You Are in a Moving Vehicle***

1. Do not drive into flooded areas.
2. If floodwaters rise around your car, abandon it. Move to higher ground safely.
3. Know that 6 inches of water will reach the bottom of most passenger cars causing loss of control and possible stalling.
4. Know that most vehicles begin to float in just 12 inches of water. 24 inches of water will sweep most vehicles (including SUVs and pick-ups) away.

## Title: How to recognize and use components in soil survey

**Type:**     ☐ Skill     ☒ Knowledge

Performance Objectives: The Soil Scientist will be able to:

- Repeat the context for use of components
- List and define the 6 kinds of components
- Recognize what a Variant from past soil surveys is today

Trainer Preparation:

- Be familiar with SSM and NSSH materials
- Pull together local examples of the 6 kinds of components prior to training (see Cycle Step 4 below)

Special Requirements:

- None

Prerequisite Modules:

- None

Procedure:

- Follow the Five Step OJT Cycle for Knowledge Oriented Training

Notes/Purpose:

- Acquire this knowledge prior to attendance of the Soil Correlation course
- Testing during the Soil Correlation course will include measurement of this knowledge
- Exercises during the Soil Correlation course will require this knowledge
- Map unit design and correlation within the assigned MLRA requires this knowledge

Authors:

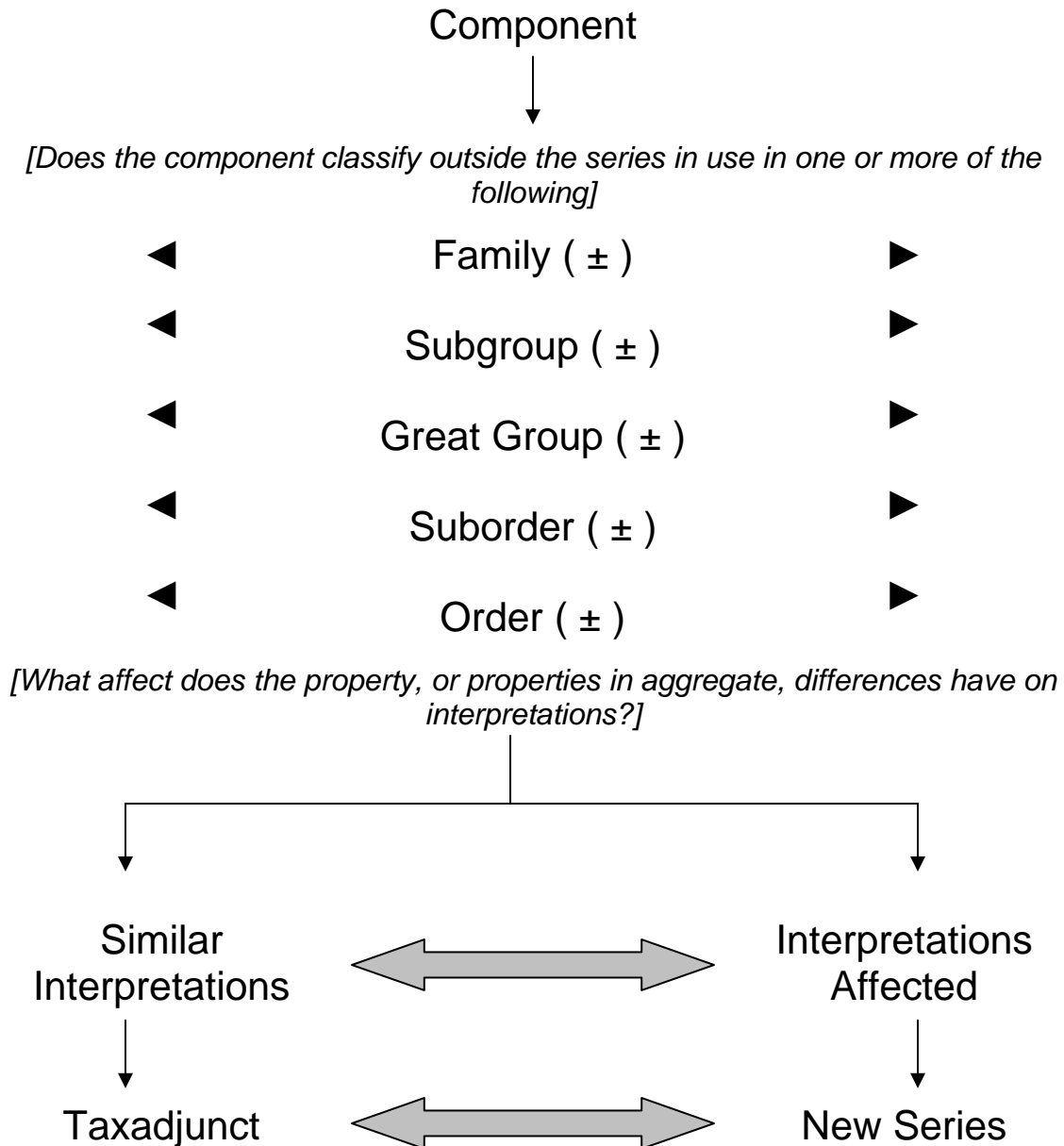
- Marc Crouch, Soil Scientist, NSSC, Lincoln, NE
- Thor Thorson, SDQS, MO1, Portland, OR
- Chad Remley, SDQS, MO5, Salina, KS

Approved by:

Title : <b>How to recognize and use components in soil survey</b>	
<b>WHAT</b>	<b>WHY, WHEN, WHERE, HOW, SAFETY, QUALITY</b>
OJT Cycle for Knowledge Step 1	SSPL and Soil Scientist review objective(s) of module, agree as to what are components, where are they used
OJT Cycle for Knowledge Step 2	Employee (and SSPL): <ul style="list-style-type: none"> <li>• Read/Review NSSH 627.04, NSSH Exhibit 627-1</li> <li>• Read/Review SSM pgs 20-22, 41-44</li> </ul>
OJT Cycle for Knowledge Step 3	SSPL leads, ask them to:
1. List the 6 kinds of components	Ask them to make a list
2. Define a series	Ask them to define a series

# Taxadjunct or New Series

6



## Measurement of Learning Quiz



6

1. A taxadjunct has responses to use and management that are dissimilar to those of the named series.

True

False

2. In an update, a Variant in your legend would probably be correlated to an existing series in most cases today.

True

False

3. A new miscellaneous area may be used without approval from the NSSC.

True

False

4. In a present day update or initial project, an unnamed component would not fit into any soil series.

True

False

5. A soil series is part of our current classification system hierarchy.

True

False

6. Phasing components allows you to have 2 or more of the same named component, each with different interpretive properties.

True

False

7. Aksarben (a soil series), deep is an example of a \_\_\_\_\_ series component